

Historic, Archive Document

Do not assume content reflects current scientific knowledge, policies, or practices.

FOREST SERVICE

U.S. DEPARTMENT OF AGRICULTURE

ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION

PUBLICATIONS SECTION

Specific Gravity of Alligator Juniper in Arizona

Roland L. Barger and Peter F. Ffolliott¹

Alligator juniper (Juniperus deppeana Steud.), largest of the western junipers, is found from southwestern Texas through New Mexico and Arizona. Commonly a medium-sized tree with short, heavy bole and broad, spreading crown, it may attain bole diameters exceeding 6 feet. The species characteristically occurs in mixture with other woodland and coniferous species from 4,500 to 8,000 feet elevation, seldom forming pure stands.² The small cones, commonly called "berries," are a valuable source of wildlife food.

Past utilization of the species has been limited largely to fenceposts and fuelwood; however, additional potential uses continue to create interest. The fragrant, deep reddish-brown heartwood of alligator juniper resembles eastern redcedar, which suggests potential uses in chests, cabinets, and novelty items. Recent interest has been shown in producing both charcoal and particleboard from the wood.

Appraising suitability for possible new uses requires some knowledge of the physical characteristics of the wood. Specific gravity provides the best single index to such properties as wood strength, stiffness, shock resistance, hardness or wear resistance, and charcoal or fiber recovery. The variability to be expected in these properties can similarly be inferred from specific gravity variation. Consequently, an adequate measure of specific gravity for the species is desirable.

Increment cores were collected from a random sample of alligator juniper trees on the Beaver Creek Watershed Evaluation Project,³ as a part of other research studies underway. These cores were used to establish a measure of specific gravity, and variation in specific gravity, at breast height. Analytic procedures described by the U. S. Forest Products Laboratory were used to process the cores.⁴ Specific gravity based on green volume and oven-dry weight, and wood density in pounds per cubic foot, were computed for

¹Wood Technologist and Associate Silviculturist, respectively, located at Flagstaff, in cooperation with Arizona State College; central headquarters are maintained at Fort Collins, in cooperation with Colorado State University.

²Little, Elbert L., Jr. *Southwestern trees. A guide to the native species of New Mexico and Arizona.* U. S. Dept. Agr. Agr. Handb. 9, 109 pp., illus. 1950.

³A 275,000-acre watershed on the Coconino National Forest in northern Arizona where costs and benefits of intensive multiple-use land management are being evaluated as a part of the Arizona Watershed Program.

⁴U. S. Forest Products Laboratory. *Methods of determining the specific gravity of wood.* U. S. Forest Serv., Forest Prod. Lab. Tech. Note B-14, 6 pp., illus. 1956.

Table 1. --Specific gravity and density, based on ovendry weight and green volume, of alligator juniper at breast height by the increment core method

Size or form class	Number of trees	Specific gravity			Density, 95 percent confidence interval for true mean
		Maximum	Minimum	95 percent confidence interval for true mean	<u>Lbs. /cu. ft.</u>
By diameter class:					
0 - 10.9 inches	9	0.533	0.478	0.495 ± 0.013	30.9 ± 0.80
11 - 20.9 inches	8	.471	.372	.440 ± .027	27.5 ± 1.67
21 - 40.9 inches	20	.497	.398	.442 ± .012	27.6 ± .77
41 inches and over	9	.497	.399	.446 ± .023	27.8 ± 1.41
By stem form class:					
Single stem	23	.508	.372	.458 ± .015	28.6 ± .94
Fork between ground line and breast height	17	.497	.398	.442 ± .013	27.6 ± .84
Fork at ground line	6	.533	.426	.465 ± .040	29.0 ± 2.47
All classes:	46	.533	.372	.453 ± .010	28.3 ± .61

each tree (table 1). Since alligator juniper assumes several definite stem forms, both diameter and stem form classes were recognized.

Charcoal recovery can be estimated as one-third the weight and one-half the volume of the wood from which it is made.⁵ Assuming an average solid wood content of 80 cubic feet per cord, charcoal recovery of approximately 750 pounds per cord could be expected. Because charcoal would have a density of approximately 19 pounds per cubic foot, it would probably require briquetting to facilitate marketing.

Other physical characteristics of the wood may be estimated from specific gravity. One of the more important properties of furniture and cabinet woods is hardness. Hardness rep-

resents resistance of the wood to wear and marring, and is commonly expressed as the load in pounds necessary to imbed a prescribed object in the wood. Hardness is directly related to specific gravity, and may be estimated by the equations:

$$\text{End hardness} = 3,740 G^{2.25}$$

$$\text{Side hardness} = 3,420 G^{2.25}$$

where G represents specific gravity based on ovendry weight and green volume.⁴ Computed end and side hardness values for alligator juniper are approximately 630 pounds and 580 pounds, respectively. These values compare well with the hardness of eastern redcedar (760, 650), and are double the values for ponderosa pine (300, 310).⁶ Alligator juniper then ranks among the harder softwoods, and is thus suitable for uses where moderate resistance to wear and marring is important.

⁵U. S. Forest Products Laboratory. *Charcoal production, marketing, and use*. U. S. Forest Serv., Forest Prod. Lab. Rpt. 2213, 137 pp., illus. 1961.

⁶Markwardt, L. J., and Wilson, T. R. C. *Strength and related properties of woods grown in the United States*. U. S. Dept. Agr. Tech. Bul. 479, 99 pp., illus. 1935.